UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/627,322	07/25/2003	Raghu Nath Bhattacharya	14388.28	2290

45200 7590 05/22/2007

KIRKPATRICK & LOCKHART PRESTON GATES ELLIS LLP
1900 MAIN STREET, SUITE 600
IRVINE, CA 92614-7319

EXAMINER	
BARTON, JEFFREY THOMAS	

ART UNIT	PAPER NUMBER
1753	

MAIL DATE	DELIVERY MODE
05/22/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/627,322	BHATTACHARYA, RAGHU NATH	
	Examiner	Art Unit	
	Jeffrey T. Barton	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 March 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) *1* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed on 19 March 2007 does not place the application in condition for allowance.

Status of Objections and Rejections Pending Since the Office Action of 18 December 2006

2. All objections are withdrawn due to Applicant's amendments.

3. All rejections based on Yukawa et al as a teaching reference are withdrawn due to Applicant's amendment.

4. All other rejections are maintained.

Election/Restrictions

5. Applicant's election with traverse of Group II, claims 2-11 (now claims 2-17) in the reply filed on 19 March 2007 is acknowledged. The traversal is on the ground(s) that there is no burden for the search and examination of the claim along with the elected claims. This is not found persuasive because every limitation of claim 1, except for the conventional material from which the cell is made (i.e. CIGS), is not present in the elected claims. The claim requires a search on these limitations, which is not required in searching the elected claims. Therefore, a clear burden is present in the examination of this claim, which bears essentially no recited relationship with the elected group.

The requirement is still deemed proper and is therefore made FINAL.

6. This application contains claim 1 drawn to an invention nonelected with traverse in the reply filed on 19 March 2007. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 2-9, 15, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bhattacharya et al (US Patent No. 5,730,852) in view of Lowenheim.

Bhattacharya et al disclose a method of preparing a copper indium gallium diselenide (CIGS) film comprising: providing a glass substrate with molybdenum layer (Column 2, lines 64-67), providing an electrodeposition bath having the elements required (Column 4, lines 56-58), placing the substrate in the bath to form a CIGS layer (Column 2, lines 64-67), and adjusting the composition of the CIGS layer by addition of indium by physical vapor deposition. (Column 3, lines 4-8)

Regarding claim 17, Bhattacharya disclose these supporting electrolytes. (Column 3, lines 65-68)

Bhattacharya et al do not explicitly disclose using an electrodeposition bath buffered to a pH of approximately 2-3, although they discuss the importance of avoiding hydroxide formation in the bath via electrolysis of water. (Column 4, lines 1-6)

Lowenheim teaches the general use of a buffer for controlling the pH of an electrodeposition bath. (Pages 120-121 and the section "pH and Plating" on pages 516-517)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Bhattacharya et al by including a buffer to control the pH of the plating solution, as taught by Lowenheim et al, because Lowenheim et al teach that control of the pH of a plating solution is an important consideration, and that buffers can be used to provide such control. (Pages 120-121 and the section "pH and Plating" on pages 516-517) Particularly since Bhattacharya recognizes that production of excess hydroxide in the bath is to be avoided (Column 4,

lines 1-6), a skilled artisan would have recognized the desirability of using a buffer to maintain the pH at suitable levels.

For selection of the buffered pH, it would clearly have been obvious to select a pH within the range disclosed by Bhattacharya (i.e. pH=1.4-2.4; Column 3, lines 58-60), which substantially overlaps the range instantly claimed, because Bhattacharya teaches that plating the film at such a pH is preferable. (Column 3, lines 58-60; see also Examples 1-3)

10. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bhattacharya et al (US Patent No. 5,730,852) in view of Lowenheim, Chen et al, and Biter et al.

Bhattacharya et al disclose a method of preparing a copper indium gallium diselenide (CIGS) photovoltaic cell comprising: providing a glass substrate and applying a molybdenum layer onto this substrate (Column 2, lines 64-67); providing an electrodeposition bath having the elements required (Column 4, lines 56-58); placing the substrate in the bath to form a CIGS layer (Column 2, lines 64-67); adjusting the composition of the CIGS layer by addition of indium by physical vapor deposition (Column 3, lines 4-8); depositing an n-type layer of CdS onto the CIGS layer (Column 5, lines 24-26); depositing a first zinc oxide layer onto the CdS layer by RF sputtering (Column 5, lines 32-37); depositing an aluminum oxide doped zinc oxide layer onto the first zinc oxide layer (Column 5, lines 37-41); applying a nickel/aluminum contact layer

to the aluminum oxide doped zinc oxide layer (Column 5, lines 45-49); and depositing a magnesium fluoride antireflective layer onto the contact layer. (Column 5, lines 52-54)

Bhattacharya et al do not explicitly disclose using a buffered electrodeposition bath, although they discuss the importance of avoiding hydroxide formation in the bath via electrolysis of water. (Column 4, lines 1-6) In addition, they do not explicitly disclose forming the molybdenum layer by RF sputtering, nor do they disclose depositing the CdS layer by electrodeposition.

Lowenheim teaches the general use of a buffer for controlling the pH of an electrodeposition bath. (Pages 120-121 and the section "pH and Plating" on pages 516-517)

Chen et al teach a method for forming I-III-VI solar cells comprising using RF sputtering, among other methods, to deposit a molybdenum layer. (Column 3, lines 39-45; Column 6, lines 19-21)

Biter et al teach a method of forming a solar cell comprising applying an n-type CdS layer to a p-type layer by using electrodeposition. (Claim 3)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Bhattacharya et al by including a buffer to control the pH of the plating solution, as taught by Lowenheim et al, because Lowenheim et al teach that control of the pH of a plating solution is an important consideration, and that buffers can be used to provide such control. (Pages 120-121 and the section "pH and Plating" on pages 516-517) Particularly since Bhattacharya recognizes that production of excess hydroxide in the bath is to be avoided (Column 4,

lines 1-6), a skilled artisan would have recognized the desirability of using a buffer to maintain the pH at suitable levels.

For selection of the buffered pH, it would clearly have been obvious to select a pH within the range disclosed by Bhattacharya (i.e. pH=1.4-2.4; Column 3, lines 58-60), which substantially overlaps the range instantly claimed, because Bhattacharya teaches that plating the film at such a pH is preferable. (Column 3, lines 58-60; see also Examples 1-3)

It would also have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the method of Bhattacharya et al by using RF sputtering to deposit the molybdenum layer, as taught by Chen et al, because Chen et al teach that the molybdenum layer in this type of solar cell can be deposited using several substantially equivalent techniques, including RF sputtering.

It would also have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the method of Bhattacharya et al by depositing the CdS layer by electrodeposition, as taught by Biter et al, because Bhattacharya et al teach that "thin film solar cells made by electrodeposition techniques are generally much less expensive" (Column 1, lines 64-66), providing financial motivation for such modification.

11. Claims 12, 13, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bhattacharya et al and Lowenheim as applied to claims 2-9, 15, and 17 above, and further in view of Liang et al and Kegeles et al.

Bhattacharya et al and Lowenheim teach methods as described above in addressing claims 2-9, 15, and 17.

Neither Bhattacharya et al nor Lowenheim explicitly teach using a potassium biphthalate/sulfamic acid buffer for maintaining pH.

Liang et al teach maintaining the pH of a solution at 2.0 with a potassium biphthalate/sulfamic acid buffer. (Page 3650, "Comparative Corrosion Studies" section, 1st sentence)

Kegeles et al teach maintaining the pH of a solution at 2.0 with a potassium biphthalate/sulfamic acid buffer. (Page 303, "Radioligand preparation" section, 1st sentence)

Liang et al, Kegeles et al, Bhattacharya et al, and Lowenheim are analogous art in that they are concerned with the problem of maintaining a solution at a desired pH, which is approximately pH=2 in Liang et al, Kegeles et al, and Bhattacharya.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Bhattacharya and Lowenheim by specifically using a potassium biphthalate/sulfamic acid buffer to control solution pH, as taught by Liang et al and Kegeles et al, because Liang et al and Kegeles et al demonstrate that this buffer is useful for maintaining a solution at pH=2, which is within the range preferred by Bhattacharya. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). In this case, it is clear that potassium biphthalate/sulfamic acid buffers were known to be

useful for maintaining a solution at pH=2. Based on the teaching of a preferred pH=1.4-2.4 by Bhattacharya and the advantageousness of using a buffer to control pH at a desired level by Lowenheim, it would clearly have been obvious to a skilled artisan to select a known buffer for maintaining the desired pH, i.e. potassium biphthalate/sulfamic acid as taught by Liang et al and Kegeles et al.

12. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bhattacharya et al, Lowenheim, Chen et al, and Biter et al as applied to claims 10 and 11 above, and further in view of Liang et al and Kegeles et al.

The reasoning for this rejection parallels that given above in the preceding paragraph.

Response to Arguments

13. Applicant's arguments filed 19 March 2007 have been fully considered but they are not persuasive.

Applicant argues that a buffered electrodeposition bath having a pH ranging from approximately 2-3 was not taught or suggested by the prior art of record. On the contrary, Bhattacharya et al teach a preferred pH range of 1.4-2.4, which overlaps the range instantly claimed, and based on the teaching of the desirability of buffer solutions in electrodeposition by Lowenheim, a skilled artisan would clearly have been motivated to buffer the deposition bath in the preferred range of the primary reference, as put forth in the rejections above.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Jeffrey T. Barton whose telephone number is (571) 272-1307. The examiner can normally be reached on M-F 9:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JTB
17 May 2007

NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700